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A.D. 1868, 23rd NOVEMBER. N<sup>o</sup> 3562.

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S P E C I F I C A T I O N

OF

THOMAS SMITH

AND

JOHN VAN NORDEN BAZALGETTE.

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DEODORIZING AND MANUFACTURING  
MANURES FROM SEWAGE, &c.

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A.D. 1868, *23rd* NOVEMBER. N° 3562.

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**Deodorizing and Manufacturing Manures from  
Sewage, &c.**

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**LETTERS PATENT** to Thomas Smith, M.D., of Portland House, Cheltenham, and John Van Norden Bazalgette, of the Langham Hotel, Portland Place, in the County of Middlesex, for the Invention of “**IMPROVEMENTS IN DEODORIZING AND MANUFACTURING MANURES FROM SEWAGE AND OTHER FOUL WATERS, AND IN APPARATUS EMPLOYED THEREIN.**”

Sealed the 4th May 1869, and dated the 23rd November 1868.

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**PROVISIONAL SPECIFICATION** left by the said Thomas Smith and John Van Norden Bazalgette at the Office of the Commissioners of Patents, with their Petition, on the 23rd November 1868.

We, THOMAS SMITH, M.D., of Portland House, Cheltenham, and JOHN  
5 VAN NORDEN BAZALGETTE, of the Langham Hotel, Portland Place, in  
the County of Middlesex, do hereby declare the nature of the said  
Invention for “**IMPROVEMENTS IN DEODORIZING AND MANUFACTURING MANURES**



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FROM SEWAGE AND OTHER FOUL WATERS AND IN APPARATUS EMPLOYED THEREIN,"  
to be as follows:—

According to this Invention the sewage or other fluid is introduced into the settling tank through openings in the wall of the tank at different heights, so as to obviate the disturbance caused in the process 5 of precipitating the solid matter by the falling of the sewage stream from the upper surface of the tank wall, also communicating a slow horizontal rotary movement to the fluid at the level of its entry into the tank. The several openings for the admission of the fluid are closed and opened by sliding traps actuated by floats. A horizontal rotatory 10 motion may also be given by an open circular duct or ducts constructed on the interior walls of the tanks, delivering the sewage or other fluid at the level in the tank, and communicating a slow horizontal motion to the fluid at or near its surface. The form of the bottom of the tanks may be varied to suit the shape of the tank whether square, round, 15 oval, or otherwise. The bottom of the tank being low on one side or on both sides with a ridge in the centre, or rising from all the sides to the centre in a conical or pyramidical form, or sinking from the sides to the centre in a conical or pyramidical form for the purpose of collecting the deposit or residuum from the sewage on one or both sides, or at the four 20 corners, or at the centre of the tanks. The deposit at the bottom of the tanks is drawn off by conduit pipes, or pipes fitted with valves or traps, or similar apparatus for opening and closing the pipes. They draw off the sewage deposit from the bottom of the tanks into the drying bed or other receptacle provided for receiving it. Chain buckets or elevators 25 are used where necessary to raise the fluid sewage deposit into the drying beds in cases where the hydraulic pressure in the tanks does not raise the fluid deposit to a sufficient elevation. Filters are employed having slate beds, on to which the liquid is admitted, and over it are beds of gravel, sand, and charcoal, up through which the liquid forces 30 its way, and so is filtered. In order to precipitate the sewage or foul water there is added to it a compound formed of sulphuric, sulphurous, and hydrochloric acid by mixing them with the several varieties of marl and mould such as are contained under the general head, term, or description of soil, loam, or earth. Or in the preparation of the above 35 deodorizing and precipitating compounds all argillaceous schists and other refuse products of mines called by miners "tipe" may be used. The precipitated and dried products are manufactured into a manurial



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compost, the basis or matrix of which is the precipitated and deodorized sewage, to which various chemical salts, such as salts of ammonia, soda, potash, and lime are added.

**SPECIFICATION** in pursuance of the conditions of the Letters Patent,  
5 filed by the said Thomas Smith and John Van Norden Bazalgette  
in the Great Seal Patent Office on the 22nd May 1869.

**TO ALL TO WHOM THESE PRESENTS SHALL COME**, we, THOMAS  
SMITH, M.D., of Portland House, Cheltenham, and JOHN VAN NORDEN  
BAZALGETTE, of the Langham Hotel, Portland Place, in the County of  
10 Middlesex, send greeting,

**WHEREAS** Her most Excellent Majesty Queen Victoria, by Her  
Letters Patent, bearing date the Twenty-third day of November, in the  
year of our Lord One thousand eight hundred and sixty-eight, in the  
thirty-second year of Her reign, did, for Herself, Her heirs and succes-  
15 sors, give and grant unto us, the said Thomas Smith and John Van  
Norden Bazalgette, Her special licence that we, the said Thomas Smith  
and John Van Norden Bazalgette, our executors, administrators, and  
assigns, or such others as we, the said Thomas Smith and John Van  
Norden Bazalgette, our executors, administrators, and assigns, should at  
20 any time agree with, and no others, from time to time and at all times  
thereafter during the term therein expressed, should and lawfully might  
make, use, exercise, and vend, within the United Kingdom of Great  
Britain and Ireland, the Channel Islands, and Isle of Man, an Invention  
for "**IMPROVEMENTS IN DEODORIZING AND MANUFACTURING MANURES FROM SEWAGE**  
25 **AND OTHER FOUL WATERS AND IN APPARATUS EMPLOYED THEREIN,**" upon the  
condition (amongst others) that we, the said Thomas Smith and John  
Van Norden Bazalgette, our executors or administrators, by an  
instrument in writing under our or their hands and seals, or under the  
hand and seal of one of us or them, should particularly describe and  
30 ascertain the nature of the said Invention, and in what manner the same  
was to be performed, and cause the same to be filed in the Great Seal  
Patent Office within six calendar months next and immediately after the  
date of the said Letters Patent.

**NOW KNOW YE**, that I, the said John Van Norden Bazalgette, on  
35 behalf of myself and the said Thomas Smith, do hereby declare the



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nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say:—

According to this Invention the sewage or other fluid is introduced into the settling tank through openings in the wall of the tank at 5 different heights, so as to obviate the disturbance caused in the process of precipitating the solid matter by the falling of the sewage stream from the upper surface of the tank wall, also communicating a slow horizontal rotary movement to the fluid at the level of its entry into the tank. A horizontal rotary motion may also be given by an open circular 10 duct or ducts constructed in the interior walls of the tanks delivering the sewage or other fluid at the level in the tank, and communicating a slow horizontal motion to the fluid at or near its surface. The form of the bottom of the tanks may be varied to suit the shape of the tank, whether square, round, oval, or otherwise. The bottom of the tank being 15 low on one side or on both sides, with a ridge in the centre, or rising from all the sides to the centre in a conical or pyramidical form, or sinking from the sides to the centre in a conical or pyramidical form for the purpose of collecting the deposit or residuum from the sewage on one or both sides, or at the four corners, or at the centre of the tanks. 20 The deposit at the bottom of the tanks is drawn off by conduit pipe or pipes fitted with valves or traps, or similar apparatus for opening and closing the pipes. They draw off the sewage deposit from the bottom of the tanks into the drying bed or other receptacle provided for receiving it. Chain buckets or elevators are used when necessary to 25 raise the fluid sewage deposit into the drying beds in cases where the hydraulic pressure in the tanks does not raise the fluid deposit to a sufficient elevation. Filters are employed having beds on to which the liquid is admitted, and over them are layers of gravel, sand, and charcoal, up through which the liquid forces its way, and so is filtered, or peat 30 may be used as the filtering material.

These arrangements of apparatus are illustrated by the annexed Drawings.

Figure 1 is a longitudinal section of the settling tanks and apparatus connected therewith arranged in the manner which we prefer; Figure 2 35 is a plan, and Figure 3 is a transverse section taken at the line 1, 1, Figure 1. *a* is the main sewer in which a water wheel is mounted at *a*<sup>1</sup> to turn the barrel of a delivering apparatus which discharges into the



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sewer measured quantities of a deodorizing mixture herein-after described. The sewage so mixed falls into the tumbling bay *b* from which it escapes by the inclined openings *c* into the settling tank *d*. There are series of openings *c* at short distances one above the other in the tank  
5 wall so that there may be no fall out of the tumbling bay *b* into the tank to disturb the deposit of the solid matters, and the openings are inclined so that a slow rotary motion in a horizontal plane may be communicated to the contents of the tank by the inward flow, this motion tends to collect the solid matters in the centre of the tank which  
10 in this arrangement (as is on the whole preferred) is made lower than the other parts of the bottom, although if desired the bottom may be made lower at the sides or corners in place of in the centre so long as a lower part is provided for the collection of the solid matters; when the semi-fluid deposit has accumulated it is drawn off by the culvert *e* from  
15 the lowest part of the bottom by opening a sluice with which the culvert is provided, it is either run at once on to drying beds or is raised by chain buckets or elevators on to such beds as may be most convenient. The liquid after settling more or less escapes at *f* into the second tumbling bay *g*, from which it passes into another settling tank *h*, where  
20 a further deposit takes place which is from time to time drawn off as before. The escape from this tank is not by overflow but by upward filtration through the filter *i*, which may be of any convenient construction, it may be a number of brickwork arches at the bottom built open so that the liquid can permeate up through them, and on the arches  
25 the filtering material, it may be peat, to make an artificial manure, or it may be gravel, sand, and charcoal, or such like material, is laid. The liquid flows over at the top of the filter and is collected in a tank *k*, out of which it is again filtered at *l*, after which it is sweet and pure, and may be allowed to pass to any convenient outfall.

30 Figure 4 shows in plan, and Figure 5 in transverse section, another form which may be given to the settling reservoirs, that is to say, they may be made triangular with the bottoms inclining alternately either way, and with sluices fitted at the lowest part and opening into a culvert into which the semi-fluid deposit is discharged and conveyed to drying  
35 beds on to which it is either run directly or lifted as may be convenient. In order to precipitate the sewage or foul water there is added to it an acid compound called hereafter a defecating, deodorizing, or precipitating marl, clay, mould, or earth, and it is invented for the object of defecating,



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deodozing, and precipitating sewage matters and destroying animalcules, fungi, and like parasitic productions. In the preparation of this compound we use  $\frac{1}{10}$ th part of the acid to 9 parts of the base, which may be either marl, clay, mould, such as are contained under the general head, term, or description of soil, loam, or earth, argillaceous and aluminous schists, and other refuse products called by miners "tipe" as well as ashes of wood or coal and coke. The acids we use are sulphuric, sulphurous, and hydrochloric acids. The marl, clay, mould, or earth is to be thoroughly dried and pulverized previous to its mixture with the acid, which is to be thoroughly incorporated with the whole mass, as sewage matters differ in their composition owing to the admixture of the refuse from chemical or manufacturing works, so it is sometimes found in practice that a combination formed of sulphuric and hydrochloric acids effects a more rapid defeccation than when either of these acid mixtures are used alone. When the sewage matter abounds in animalcules or fungi it requires to be treated in the first instance by a mixture formed of sulphurous acid, marl, clay, or mould in similar proportions as the aforesaid. About 200 pounds of this defeccating, deodorizing, or precipitating, marl, clay, or mould is sufficient to treat sewage matters of a population of 10,000 persons per diem. The action of the powder should be continuous and without intermission night and day, that is delivered into the sewage stream by means of two hoppers, so constructed that each will allow 4 pounds per hour to pass into the sewage stream. In treating very offensive sewage matters, or such as contain any kind of organic growth which it is desirable to destroy, the marl, clay, or mould prepared with sulphurous acid should be placed into the first hopper, and the second may contain either acidulated mould or marl, or a mixture formed by the combination of hydrochloric and sulphuric acids with the marl, mould, or any of the before-mentioned articles. Three filter beds should be used, the first made upward, and charged with peat, which when dried is to be mixed with the sewage residuum, and treated with sulphuric acid to form the sewage manure. The last filter may be made of animal or marine charcoal and sand, as different crops require a different kind of manure, so that the matrix or basis of the sewage matter as prepared above may be supplemented by the addition of ammoniacal salts, chloride of sodium, nitrate of soda, sulphate of magnesia, and these salts vary in their proportions as the nature of the soil or the character of the crop indicate and require.



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What we claim is, the improvements in deodorizing and manufacturing manures from sewage and other foul waters, and in apparatus employed therein, substantially as herein described.

5 In witness whereof, I, the said John Van Norden Bazalgette, have hereunto set my hand and seal, this Twenty-first day of May, in the year of our Lord One thousand eight hundred and sixty-nine.

J. VAN NORDEN BAZALGETTE. (L.S.)

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LONDON :

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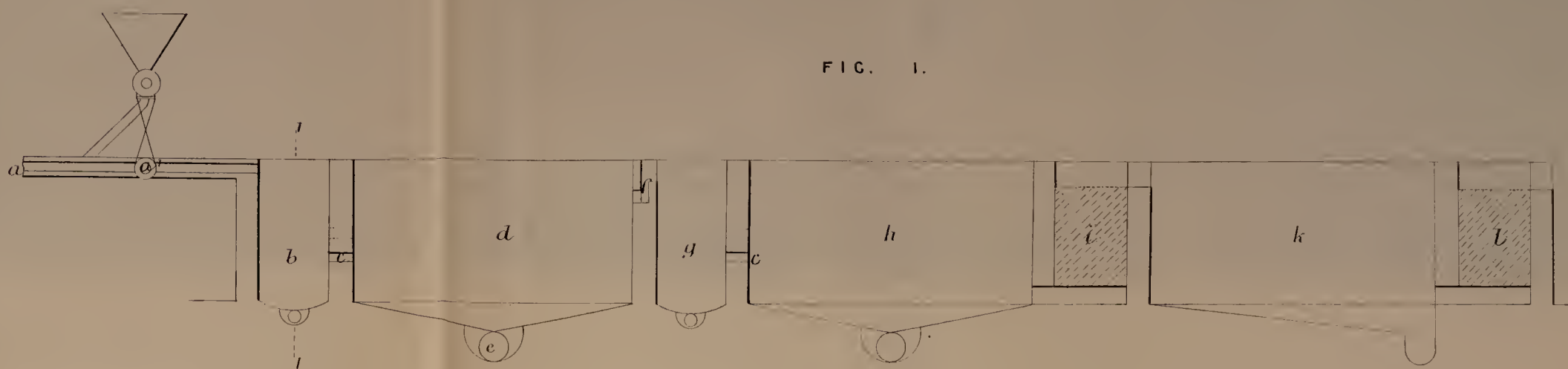


FIG. 3.

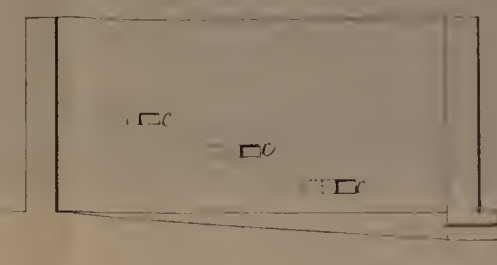


FIG. 2.

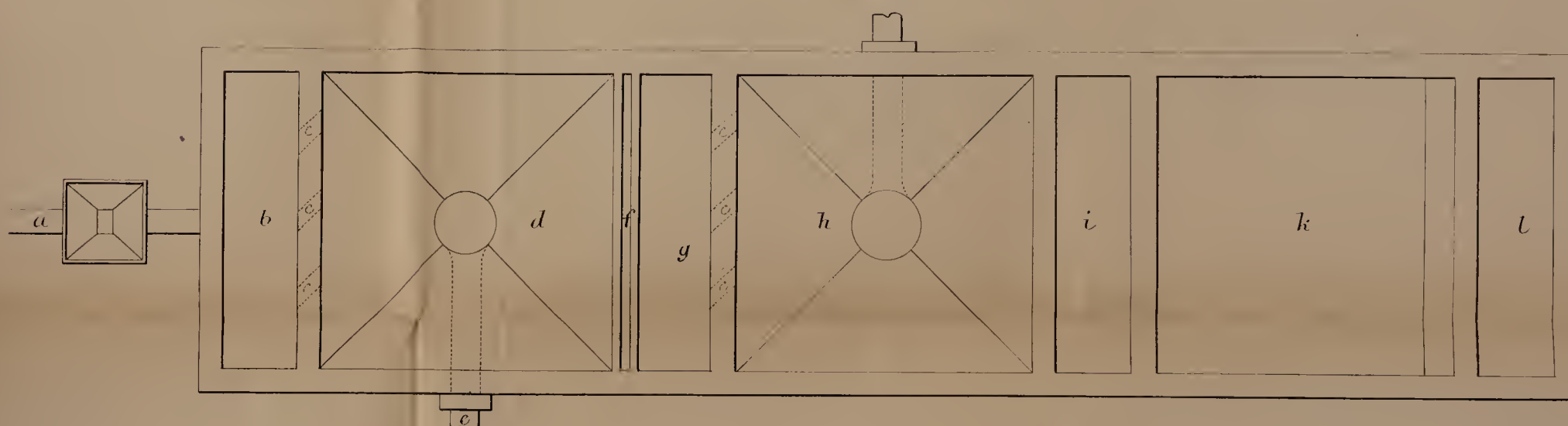


FIG. 4.

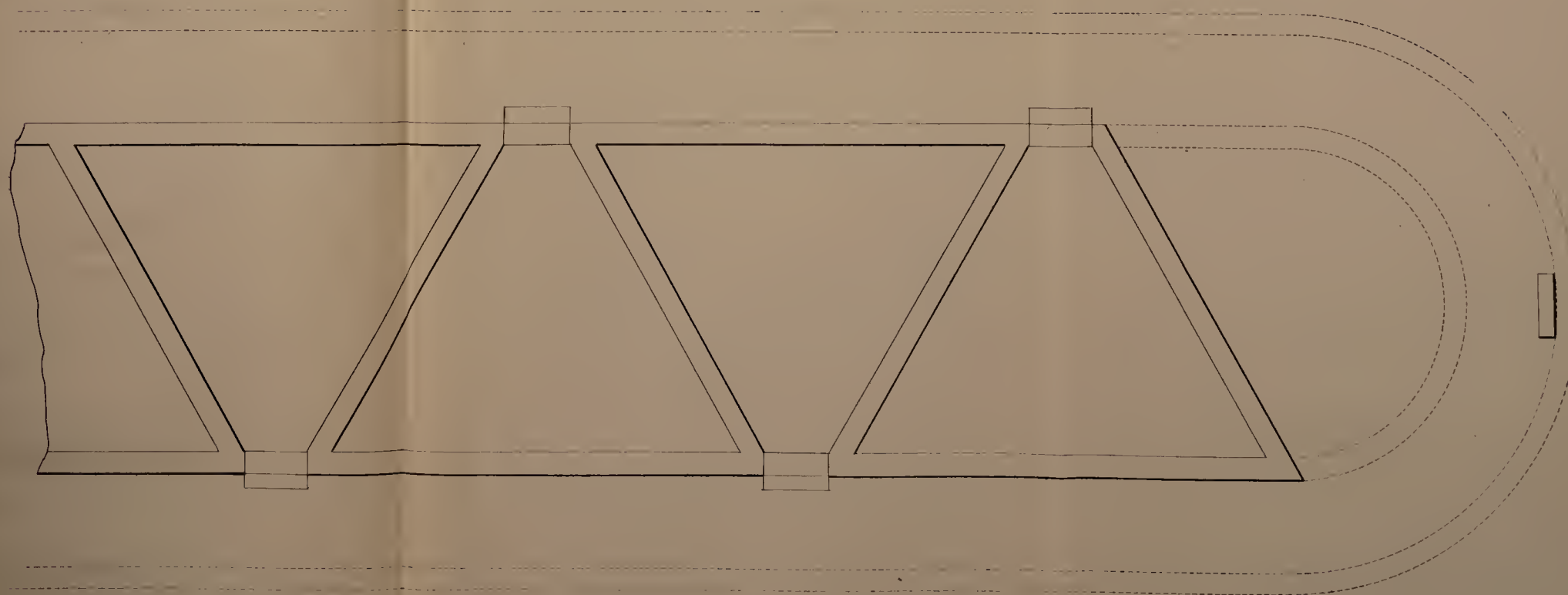
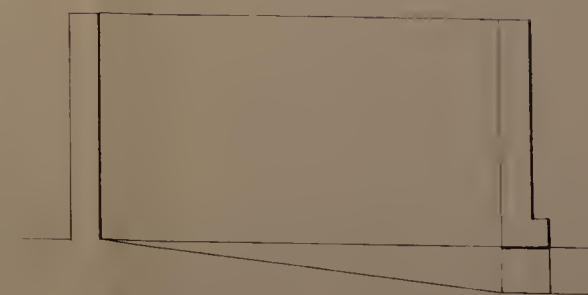


FIG. 5.



The tiled drawing is partly colored.

Drawn on Stone by Malby & Sons



